

Claims:

- 1 1. A processing chamber, comprising:
2 a) a chamber body having a substrate support member disposed therein;
3 b) a chamber cover, comprising:
4 i) a retaining ring; and
5 ii) a lid, comprising:
6 a) a first plate and a second plate sealably connected together and
7 defining a fluid channel at least partially therebetween; and
8 b) a fluid inlet and outlet fluidly connected to the fluid channel.
- 1 2. The processing chamber of claim 1, wherein the lid is connected to the retaining ring by
2 one or more feedthroughs.
- 1 3. The processing chamber of claim 2, wherein the one or more feedthroughs enable fluid
2 flow into and out of the fluid inlet and fluid outlet.
- 1 4. The substrate processing system of claim 1, wherein the lid further comprises one or
2 more feedthrough pockets in which the one or more feedthroughs are received to connect the
3 lid to the retaining ring.
- 1 5. The substrate processing system of claim 4, wherein the one or more feedthroughs
2 comprise an enlarged engagement portion insertable into the one or more feedthrough pockets.
- 1 6. The substrate processing system of claim 5, wherein the one or more feedthrough
2 pockets comprise a pocket shoulder to receive a sealing element therein.
- 1 7. The substrate processing system of claim 6, further comprising a fastener adapted to
2 attach the feedthrough to the retaining ring.
- 1 8. The substrate processing system of claim 7, wherein the retaining ring defines one or

2 more fluid passages and one or more feedthrough channels fluidly connected to the fluid
3 passages.

1 9. The substrate processing system of claim 4, wherein the feedthrough comprises a
2 channel along its length and one or more ports connected to the channel.

1 10. The substrate processing system of claim 8, wherein the retaining ring comprises a
2 pocket alignment shoulder adapted to align the lid to the retaining ring.

1 11. The substrate processing system of claim 1, wherein the first and second plates each
2 comprise a portion of the fluid channel.

1 12. The substrate processing system of claim 11, wherein the fluid channel is continuous
2 between the inlet and the outlet.

1 13. The substrate processing system of claim 12, further comprising a feedthrough pocket
2 fluidly connected to the lid passageway and adapted to connect to a feedthrough to secure the
3 lid to the retaining ring.

1 14. The substrate processing system of claim 13, wherein the passageway forms a
2 circuitous pattern substantially throughout the lid.

1 15. The substrate processing system of claim 14, wherein the passageway surface area
2 comprises at least about 35% of the surface area of the lid.

1 16. The substrate processing system of claim 15, wherein the lid is an energy transparent
2 window or an electrode.

1 17. The substrate processing system of claim 16, wherein the energy transparent window or
2 electrode are made of a material selected from the group comprising aluminum oxide,
3 aluminum nitride, silicon carbide, silicon, polysilicon and combinations thereof.

- 1 18. A temperature controllable lid for a processing system, comprising:
2 a) a first plate sealably connected to a second plate:
3 b) at least one channel formed between the first and second plates; and
4 c) one or more inlets and one or more outlets connected to the channel.
- 1 19. The lid of claim 18 wherein the first and second plates each comprise a portion of the
2 temperature control passageway.
- 1 20. The lid of claim 18, wherein the temperature control passageway is continuous between
2 an inlet and outlet.
- 1 21. The lid of claim 18, wherein the passageway is disposed over about 35% of the surface
2 area of the lid.
- 1 22. The lid of claim 18, wherein the lid comprises at least one feedthrough pocket in fluid
2 communication with the passageway and a feedthrough disposed in the feedthrough pocket.
- 1 23. The lid of claim 22, wherein the feedthrough pocket comprises a pocket shoulder and a
2 sealing element circumferentially disposed around the feedthrough in proximity to the pocket
3 shoulder.
- 1 24. The lid of claim 23, wherein the feedthrough comprises an enlarged engagement
2 portion adapted to be inserted into the feedthrough pocket.
- 1 25. The lid of claim 24 wherein the plates define two or more channels, each channel
2 connected to at least one inlet and one outlet.
- 1 26. The lid of claim 18 wherein the plates are comprised of a material selected from the
2 group comprising aluminum oxide, aluminum nitride, silicon carbide, silicon, polysilicon and
3 combinations thereof.

1 27. The lid of claim 18 wherein at least one of the plates is made of a metal.

1 28. The lid of claim 27 wherein another of the plates is made of a material selected from
2 the group comprising aluminum oxide, aluminum nitride, silicon carbide, silicon, polysilicon
3 and combinations thereof.

1 29. A processing chamber, comprising:
2 an enclosure having a first electrode for supporting a substrate in the enclosure; and
3 a second electrode opposed to the first electrode, the second electrode comprising:
4 a first plate having a first surface disposed at least partially in the enclosure and
5 a second surface connected to a support frame;
6 one or more channels disposed at least partially in the first plate; and
7 one or more fluid connectors fluidly connected to the one or more channels.

1 30. The processing system of claim 29 further comprising a power source connected to the
2 second electrode.

1 31. The processing chamber of claim 29 wherein the first plate is comprised of a material
2 selected from the group consisting of graphite, polycrystalline silicon, quartz, glassy carbon,
3 single crystal silicon, pyrolytic graphite, silicon carbide, alumina, zirconium, diamond coated
4 materials, titanium oxide or combinations thereof.

1 32. The processing system of claim 29 wherein the first plate is comprised of a metal.

1 33. The processing chamber of claim 29 further comprising a backing plate adjacent a
2 sidewall of the first plate opposite the first electrode.

1 34. The processing system of claim 33 wherein the backing plate is comprised of a metal
2 and the first plate is comprised of a material selected from the group consisting of graphite,
3 polycrystalline silicon, quartz, glassy carbon, single crystal silicon, pyrolytic graphite, silicon

4 carbide, alumina, zirconium, diamond coated materials, titanium oxide or combinations
thereof.

1 35. An electrode assembly for use in a wall of a processing chamber, comprising:
2 an electrode having a substantially uniform thickness and defining one or more fluid
3 channels at least partially therethrough; and
4 a support frame connected at least partially to one surface of the electrode.

1 36. The electrode assembly of claim 35 wherein the electrode is comprised of a plate and
2 the plate defines one or more apertures therethrough.

1 37. The electrode assembly of claim 36 further comprising a backing plate supporting the
2 electrode.

1 38. The electrode assembly of claim 35 wherein the electrode is comprised of a material
2 selected from the group consisting of graphite, polycrystalline silicon, quartz, glassy carbon,
3 single crystal silicon, pyrolytic graphite, silicon carbide, alumina, zirconium, diamond coated
4 materials, titanium oxide or combinations thereof.

1 39. The electrode assembly of claim 35 wherein the electrode is comprised of a metal.

1 40. The electrode assembly of claim 35 wherein the electrode comprises a coating of
2 graphite, polycrystalline silicon, quartz, glassy carbon, single crystal silicon, pyrolytic graphite,
3 silicon carbide, alumina, zirconium, diamond coated materials, titanium oxide or combinations
4 thereof formed thereon.

1 41. A plasma chamber for processing a workpiece, comprising:
2 a workpiece support; and
3 a chamber cover facing said workpiece support, the chamber cover comprising:
4 a first plate;
5 a second plate sealably engaged with the first plate; and

6 at least one fluid channel defined within said chamber cover and defining one or
7 more fluid pathways distributed generally over the area of the chamber cover.

1 42. The plasma chamber of claim 41 wherein the fluid channel is disposed at least partially
2 between the first and second plates.

1 43. The plasma chamber of claim 42 wherein the channel is partially formed between the
2 first and second plates.

1 44. The plasma chamber of claim 42 wherein the channel is defined by a groove in one of
2 the plates and the generally smooth opposing face of the other plate.

1 45. The plasma chamber of claim 42 wherein the channel is defined by grooves formed in
2 both the first and second plates.

1 46. The plasma chamber of claim 41 wherein the one or more fluid pathways are arcuate,
2 radial, meandering or combinations thereof.

1 47. The plasma chamber of claim 41 wherein the chamber cover is comprised of a
2 dielectric material, a conductive material, a semiconductive material, or combinations thereof.

1 48. The plasma chamber of claim 41 wherein one plate is comprised of one material and
2 the other plate is comprised of another material.

1 49. The plasma chamber of claim 47 wherein the plate facing the workpiece support is
2 comprised of a silicon containing material.

1 50. The plasma chamber of claim 47 wherein at least one plate is comprised of a metal or
2 alloy thereof.

- 1 51. The plasma chamber of claim 47 wherein at least one plate is comprised of aluminum
2 oxide or aluminum nitride.
- 1 52. The plasma chamber of claim 41 wherein the chamber cover comprises a conductive or
2 semiconductive electrode.
- 1 53. The plasma chamber of claim 41 wherein the chamber cover is dielectric or
2 semiconductive and is transmissive to RF energy.
- 1 54. The plasma chamber of claim 41 wherein the chamber cover comprises a window
2 transmissive to RF energy, and which further comprises an antenna disposed adjacent to the
3 chamber cover to couple RF energy through the window and into the chamber.
- 4 55. The plasma chamber of claim 54 wherein the window is an electrode.
- 1 56. The plasma chamber of claim 52 wherein a dielectric fluid is circulated through the
2 fluid channel.
- 1 57. A plasma processing chamber, comprising:
2 a substrate support;
3 an antenna to inductively couple RF energy into the chamber to energize one or more
4 processing gases within the chamber into a plasma; and
5 a window comprising a wall of the chamber between the antenna and the substrate
6 support, the window being transmissive to RF energy radiated by the antenna into the chamber
7 and defining one or more interior fluid channels disposed generally throughout the window and
8 capable of supporting a fluid flow therethrough.
- 1 58. The plasma chamber of claim 57 wherein the window comprises facing first and second
2 members, at least one of the facing members defining a groove therein comprising at least a
3 portion of the interior fluid channel, the facing members being sealingly engaged with each
4 other.

1 59. The plasma chamber of claim 58 wherein the fluid channel is disposed at least partially
2 between the facing members.

1 60. The plasma chamber of claim 58 wherein the other of the facing members defines a
2 generally smooth surface which in conjunction with the groove defines the channel.

1 61. The plasma chamber of claim 57 wherein the channel follows a circuitous path.

1 62. The plasma chamber of claim 57 wherein one or more of the fluid channels are
2 distributed generally throughout the area of the window.

1 63. The plasma chamber of claim 57 wherein the window is comprised of a dielectric or
2 semiconductive material.

1 64. The plasma chamber of claim 63 wherein at least one of the members is comprised of a
2 silicon containing material.

1 65. The plasma chamber of claim 64 wherein at least one of the members is comprised of
2 silicon.

1 66. The plasma chamber of claim 64 wherein at least one of the members is comprised of
2 silicon carbide.

1 67. The plasma chamber of claim 57 wherein the window is comprised of aluminum oxide
2 or silicon nitride.

1 68. The plasma chamber of claim 57 wherein the window is comprised of at least one of
2 silicon or silicon nitride.

1 69. The plasma chamber of claim 57 wherein dielectric fluid is flowed through the

2 channel.

1 70. The plasma chamber of claim 57 wherein the window comprises an electrode.

